23 October 1963

MEMORANDUM FOR THE RECORD

SUBJECT: Senate Commerce Committee Aviation Subcommittee Hearing - 23 October 1963

1. This afternoon's hearing by the Senate Commerce Committee Aviation Subcommittee concerning the Supersonic Transport Development Program was conducted by the Chairman, Senator Mike Monroney (D., Okla.). Senator Philip A. Hart (D., Mich.) was also present for part of the time. During the afternoon the Committee took testimony from Mr. Harold E. Gray, Executive Vice President, Overseas Division, Pan American World Airways; Mr. J. L. Atwood, President, North American Aviation, Inc.; Mr. H. M. Horner, Chairman, United Aircraft; and a representative of the Airport Operators Association.

2. Each witness was questioned at length by the Chairman on the substance of the information provided by him with practically no deviation from the material set forth in the prepared statements presented by the witness. Senator Hart asked very few questions.

3. A copy of the statement read by the Chairman of United Aircraft, Mr. H. M. Horner, and the outline of Hypothetical Costs For SST Power Plant Development presented by him, are attached.

STAT 4. [redacted] was advised of the above at the completion of the hearing.

STAT [redacted]
Assistant Legislative Counsel

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Office of the Chairman

United Aircraft

October 10, 1963

The Honorable A. S. Mike Monroney
Chairman, Aviation Subcommittee
United States Senate
Committee on Commerce
Washington, D. C.

Dear Senator Monroney:

This is in reply to your letters of October 4, 1963 addressed to me and to Mr. L. C. Mallet, Division President, Pratt & Whitney Aircraft. Thank you for the opportunity of sharing with you some of our thoughts on the nation's supersonic transport program which is now in the embryonic stage of its development. For information purposes, I am enclosing herewith a copy of a letter, dated May 12, 1960, from our Pratt & Whitney Aircraft division to the Committee on Science and Astronautics, House of Representatives, on this same subject, which letter needs little if any revision today.

While a great deal of research and study has already been devoted to this subject, I am sure you can appreciate that the translation of much of this knowledge into hardware is probably one of the most challenging assignments the United States aerospace industry has ever had to meet.

During its 38-year history Pratt & Whitney Aircraft, through its aircraft engines, has been privileged to play a role in the development and significant advances that have been made by the United States air transport industry. Our turbojet and turbofan engines currently power nine out of ten of the Boeing and Douglas jet transports, either flying or on order. In keeping with our background, we recognized the possibilities of a commercial supersonic transport several years ago. In fact, we began studying the powerplant requirements of supersonic transports and carrying out a state-of-the-art development program early in 1958. Since 1961 the Federal Aviation Agency has participated in this work with funded studies which have been carried out under the technical direction of the Air Force Aeronautical Systems Division.

These research and development programs have explored critical areas of engine technology which are of direct importance to supersonic transport applications. The experimental investigations have been continually co-ordinated with design studies of other advanced engine concepts. Such co-ordination has allowed us to direct the experimental effort into the proper channels and to provide an essential discipline for the engine design studies. Experimental and study efforts have been directed to all important areas. We have run engines at the high Mach number, high altitude conditions applicable to supersonic transport operations under simulated flight conditions in facilities that we have. We have constructed and are testing an advanced lightweight multi-stage air compressor, and have had under way for some time other vital tests of single-stage fan components to provide the required background for the design of

advanced turbofan engines which appear to us to be particularly attractive for supersonic transports. A great deal of effort is being devoted to techniques for operating engines at highest practical gas temperatures consistent with airline requirements for durability. For example, we have conducted tests on a full-scale engine at simulated supersonic transport flight operation at gas temperatures more than 400°F in excess of those employed in our current commercial jet transports. The development of new combustion techniques has also been required. Bearings and seals have been tested under the extreme environmental temperatures that normally exist during extended operation at flight speeds from two to three times the speed of sound. We have conducted tests so that the problem of providing satisfactory fuels and lubricants could be evaluated and so that the precise control of engine power in the airplane may be studied. Problems of airport and airport-neighborhood noise are being studied. Finally, all of this experimental and analytical background has been applied to design studies of engines incorporating the best possible performance, together with the reliability and durability that experience shows is required for safe and economical airline operation.

In conducting design studies of engines for the supersonic transport, Pratt & Whitney Aircraft has worked closely with the airframe industry to insure that the requirements of the various aircraft designs were recognized and met to the maximum possible degree. The true worth of a given engine design can only be judged in terms of what gains in aircraft performance are achieved. The engine design studies have covered turbojet and turbofan engines with a wide range of cycle characteristics, such as bypass ratio, compression ratio, gas temperature, thrust augmentation, and various mechanical design arrangements. We believe that the results of these studies, which have been supplied to the various aircraft manufacturers, will permit valid evaluations of the performance of possible airframe-engine combinations.

On August 26, 1963 we wrote the FAA of our intention to submit a formal proposal for the SST powerplant. This was done in answer to that agency's request for proposals dated August 15, 1963 and which asks that engine proposals be submitted by January 15, 1964. In arriving at the decision to submit an engine proposal for the SST program, Pratt & Whitney Aircraft has very carefully evaluated the extremely difficult technical problems posed by this program. We can design a turbine engine which will meet the requirements of the Supersonic Transport Request for Proposal and also the special detailed requirements of the three competing aircraft manufacturers. We believe we can develop this engine and successfully complete the existing FAA requirements for prototype engine Tentative Flight Test Status Qualification and production engine Type Certification. In this field Pratt & Whitney Aircraft feels uniquely qualified by its experience with both subsonic and supersonic military powerplants, as well as subsonic commercial applications.

While we are confident of our ability to successfully develop a satisfactory powerplant for the supersonic transport, this confidence should not be construed as diminishing the magnitude of the job to be accomplished. The supersonic transport program represents the largest single step ever attempted in the commercial air transport field. The performance and weight requirements imposed

on the engine for a safe and economically satisfactory airplane represents sizable steps in technology. Historically, the commercial aircraft engine requirements of this country have been fulfilled by the use of engine types which were originally conceived and developed for military aircraft. This has resulted in the selection for commercial aircraft of engine types which had already proven their excellence in military use, thus eliminating many possible problem areas prior to commercial operation. In the supersonic transport program this advantage is not available, and thus all of the usual technical problems normally present in such new projects must, in the case of the supersonic transport, be borne within the SST program. The use of engines adapted from military aircraft has also had a considerable effect in the past in reducing the development cost and development time of commercial engines and has provided essential service experience prior to carrying passengers.

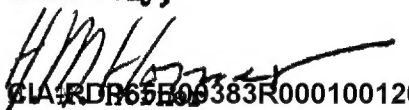
We believe that the tentative flight test status qualification and type certification programs for the supersonic transport engine can be successfully completed within the calendar of events established for these phases by the FAA and as needed to meet the aircraft manufacturers' requirements. The magnitude of the supersonic transport development problems, coupled with the required long development period, indicates that the engine development costs will be substantially greater than any prior engine program undertaken by Pratt & Whitney Aircraft. Our experience in this field leaves us with a serious concern that the amount of engine development money envisaged for this program is adequate.

A review of costs for prior engine development programs has shown that the expenditure of funds for continued engineering and development during its service life is more than equal to the development funds which are required to bring the engine to its initial qualification or certification status. The Request for Proposal on the Supersonic Transport makes no acknowledgement of this situation which obviously has a very great impact on the total development funds. The FAA "Request for Proposal" requires a substantial financial contribution towards the development program by the manufacturer and, in addition, indicates that full repayment of government advances is anticipated. The British and the French governments are taking a different and, in our opinion, a more realistic approach in supporting and financing the Concorde. In so far as we can determine, the British and the French governments are financing the development, tooling and introduction costs without requiring repayment. In our opinion, the development cost of the supersonic aircraft will be of such size that it will need substantial government support and that a 25 per cent participation by the industry is not financially feasible.

Despite the many problems which must be faced in the development of the supersonic commercial transport, both technical and financial, we strongly believe that, as expressed by us three and a half years ago in the attachment, we should go forward promptly with this project.

Again, we appreciate the opportunity to submit this statement to your committee.

Sincerely,



Chairman

HMH:grs
Attachment

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